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AUTHOR King, Suzanne; Wolfle, Lee M.
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ABSTRACT

A reanalysis was conducted of Saunier's research (1985) on sources of variation in the National Research Council (NRC) reputational ratings of university faculty. Saunier conducted a stepwise regression analysis using 12 predictor variables. Due to problems with multicollinearity and because of the atheoretical nature of stepwise regression, Saunier's conclusions were only speculative. By using LISREL, the present reanalysis demonstrated the value of regressing reputational ratings on three latent variables: (1) department size; (2) faculty research productivity; and (3) the quality of program graduates. The model was tested using NRC data for each of six disciplines: English, French, philosophy, geography, political science, and sociology. The relative magnitude of the contributions made by the three latent variables depended upon the discipline of interest, but generally size and research productivity were found to be more important than the quality of the program graduates. (Author/GDC)

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A LATENT-VARIABLE CAUSAL MODEL OF FACULTY REPUTATIONAL RATINGS

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Suzanne King

and

Lee. M. Wolfle

Virginia Polytechnic Institute and State University

TM 870 569

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ABSTRACT

Saunier (1985), in an attempt to explain sources of variation in the NRC reputational ratings of university faculty, conducted a stepwise regression analysis using twelve predictor variables. Due to problems with multicollinearity and because of the atheoretical nature of stepwise regression, Saunier's conclusions were only speculative. By using LISREL the present reanalysis demonstrates the value of regressing reputational ratings on three latent variables: size, faculty research productivity, and the quality of program graduates. The model was tested using NRC data for each of six disciplines: English, French, philosophy, geography, political science, and sociology. The relative magnitude of the contributions made by the three latent variables depended upon the discipline of interest, but generally size and research productivity were found to be more important than the quality of the program graduates.

A LATENT-VARIABLE CAUSAL MODEL OF FACULTY REPUTATIONAL RATINGS

Quality in graduate programs, as in anything else, is an abstract notion that defies precise, objective definition. Professionals in every field have a sense of which graduate programs are better than others, but it remains unclear exactly what aspects of a department are being evaluated by reputational ratings. Several such ratings have been published over the years (e.g., Cartter, 1966; Hughes, 1925, 1934; Roose & Anderson, 1970). The latest set of reputational ratings, sponsored by the National Research Council (Jones, Lindzey, & Coggeshall, 1982a, 1982b), provides a new set of reputational ratings for many of this country's graduate programs that give research doctorates in fields ranging from engineering to the humanities.

Several researchers (Beyer & Stevens, 1977; Blackburn & Lingenfelter, 1973; Elton & Rose, 1972; Hagstrom, 1971; Saunier, 1985) have attempted to measure what objective factors contribute to a graduate department's reputation. Variables considered to be potential objective measures of excellence have included a wide variety of school, department, faculty, and student descriptors. As one might expect, these various studies reached different conclusions about which objective indicators contributed to either the Cartter (1966) or Roose and Anderson (1970) ratings. For sociology and political science departments, Beyer and Stevens (1977) found that perceived resources was important for sociology, but that organization and research productivity were more

important for political science. Using psychology departments only, Elton and Rose (1972) concluded that size was the best predictor. Hagstrom (1971), however, found that size, number of citations, and undergraduate selectivity were the more important contributors to the reputations of mathemetics, physics, chemistry and biology departments.

In an attempt to better understand the variables that determine the reputation of a program's quality as presented in the latest NRC ratings (Jones, et al., 1982a, 1982b), Saunier (1985) regressed the NRC rating of quality of graduate faculty on a dozen program, student, and school variables included in the NRC reports. Her stepwise regressions were conducted with data from each of six disciplines: English, French, geography, philosophy, political science, and sociology. Saunier did not find the same variables entering into the equations in the same order for the six disciplines. She concluded, however, that indicators of department size seemed to be the most important predictors of rating. Moreover, for all three departments for which publication measures were available, at least one such variable entered her equations.

Because of multicollinearity and the resulting instability of her regression coefficients, not to mention the atheoretical approach of stepwise regression, Saunier's (1985) conclusions about the relative importance of the variables in explaining reputational ratings could be little more than speculative. In her conclusions, Saunier also could not directly address the relative importance of the latent variables that she alluded to indirectly in her discussion.

A more useful analytic approach to the study of the objective measures of reputational ratings would be to use the variables available in Jones, et al. (1982a, 1982b) as indicators of latent variables of

theoretical interest. Consider the model shown in Figure 1. The variables shown in elipses are latent factors. These are shown to be causes of the manifest indicators shown in rectangles. The structural portion of the model simply represents a multiple regression equation in which faculty ratings are regressed on three exogenous, latent factors: size of the department, the quality of the graduate program, and research productivity.

Insert Figure 1 About Here

The purpose of this paper is, accordingly, to estimate the model shown in Figure 1 and thus obtain estimates of the relative influences of department size, graduate quality, and research productivity on departmental reputational ratings. These estimates will provide a more parsimonious explanation of faculty reputational ratings than has been available heretofore, and also easier to interpret and more substantively useful.

METHODS AND DATA SOURCE

For purposes of comparison, NRC data (Jones et al., 1982a, 1982b) were selected from the same fields that Saunier (1985) used in her analyses: 106 English, 58 French, 77 philosophy, 49 geography, 83 political science, and 92 sociology departments. Figure 1 shows the model tested. The measurement model implied in Figure 1 considers department size to be the true cause of three manifest variables: number of faculty

members in the program in 1980 (FACNUM), number of graduates from the program between 1976 and 1980 (GRADNUM), and the number of full- and part-time doctoral students in 1980 (STUDNUM). Quality of graduate students in the program is considered to be the underlying cause of a single manifest variable, the fraction of graduates who, at the time of graduation, had definite employment commitments with Ph.D.-granting institutions (EMPPHD)[1]. The third latent variable, research productivity among faculty members, is indexed by the number of published articles attributed to program faculty divided by the number of faculty in the department (PUBSPER), the proportion of faculty with one or more published articles between 1978 and 1980 (MORE1PUB), and the fraction of program faculty members holding research grants from the Alcohol, Drug Abuse, and Mental Health Administration, the National Institutes of Health, or the National Science Foundation at any time during the FY1978-1980 period (GRANTS). For English, French and philosophy departments, the research productivity construct is not included since data for the three manifest indicators were not available. Accordingly, the research productivity factor was dropped from the model for these three disciplines. Estimates for the model were obtained with LISREL VI (Joreskog & Sorbom, 1986).

RESULTS

The results of our analyses are shown in Tables 1 and 2. The coefficients reported in these tables are maximum likelihood estimates produced by the LISREL program. Both metric (and their standard errors) and standardized coefficients are given. While the primary purpose of the present analysis was to provide improved estimates of the structural parameters, it is instructive to examine briefly the measurement

properties of the model. These results, shown in Table 1, indicate that for three departments (English, geography, and political science) the number of graduates was the most reliable indicator of size (with squared correlation coefficients of .86, .56, and .90, respectively). For two other departments (French and sociology) the number of students and the number of graduates were nearly equal as the most reliable indicators of size, while for philosophy, the number of students was the most reliable indicator of size. For the three social science departments (geography, political science, and sociology) whose models included the research productivity variable, for geography and sociology the most reliable indicator of the latent research factor was the number of publications per faculty member (with coefficients of .78 and .83, respectively), whereas for political science publications per faculty and the fraction of faculty with more than one publication between 1978 and 1980 were nearly equally reliable.

Insert Table 1 About Here

Examination of the standardized structural parameter estimates shown in Table 2 indicates that the size of the department is a consistently important indicator of departmental reputation. Indeed, for English, French, political science, and sociology, size is the most important indicator of departmental reputation. The second-most important indicator of departmental reputation for the three social science departments is faculty research productivity (and for geography actually

exceeds departmental size in importance by a small margin). The quality of the graduate program (as indexed by the proportion of graduates who hold positions in Ph.D.-granting institutions) seems not to play an important role in the ratings of social science departments; indeed, the estimated coefficients for geography and sociology are not even statistically significant. Program quality plays a more important role among the three humanities departments, but it is unclear whether this result is due to the actual importance of the quality of the graduate program in determining departmental reputation in the humanities, or due to the necessary omission of research productivity from the model for these departments.

Insert Table 2 About Here

It also seems evident from an examination of the metric coefficients shown in Table 2 that size, quality of the graduate program, and research productivity have differing impacts on reputational ratings across the six disciplines. For the humanities, size produces a greater increase in the rating of French departments than for English and philosophy, whereas the quality of the graduate program produces a greater increase in the rating of English departments than for French or philosophy. Among the social science departments, size and research productivity produce a greater increase in ratings for geography than for political science and sociology, whereas the quality of the graduate program

produces a greater increase in the rating of political science departments than for geography and sociology.

DISCUSSION

Based on these results, it seems clear that size is an important determinant of reputational ratings of faculty in the six disciplines included in this analysis. Either the larger departments attract faculty members of higher reputation, or the faculty within larger departments are simply better known. In either event, it does seem that part of what is being measured when one rates the reputations of faculty is mere quantity; the more faculty, students, and graduates of a department, the higher the department's reputation. This is, of course, the same conclusion reached by Saunier (1985), but here we see that the effect of size is not uniform across all six disciplines, and indeed is sometimes not as important as other objective characteristics of the departments.

For the three social science disciplines (for which publication data were available), research productivity is also an important determinant of reputational ratings. For geography, research productivity is more important than size, and for both political science and sociology it is a variable whose effect is at least three-fifths the value of the coefficient for size. It would seem, therefore, that research and publications provide an important means of exposure to peers in other institutions, an exposure reflected in the departmental reputations of faculty; which is just another way of saying that a department is known by the work of its faculty.

As for the quality of graduates of a program, this variable seems less important, particularly for the social sciences. Apparently, when people are asked to rate the reputations of departments, they do so more in reference to the size of the department and the research and publication productivity of faculty in the department than to the characteristics of the students or quality of the graduate program in the department.

In conclusion, it seems clear that two of the most important objective determinants of reputational ratings of departments are mere size and research and publication productivity. While these are the same conclusions reached by Saunier (1985), the present analysis has been able to estimate the relative effects of these latent constructs, and demonstrate that their relative influences vary by discipline. This is not to say, of course, that other factors are not also being taken into account in rating the reputations of departments. As indicated by the coefficients of determination reported at the bottom of Table 2, there is still unexplained variance in the reputational ratings of all six disciplines. One possibility may simply be the effect of history; that is, some departments may be more highly rated because they have been more highly rated in the past, an effect not necessarily reflected in the size and productivity of the <u>current</u> department.

FOOTNOTES

[1] Although Saunier (1985) used several additional variables of graduate quality (including fraction of graduates who received a national fellowship, the median number of years between enrollment and graduation, and the fraction of graduates who had employment) we have used only one indicator. Although using all four available indicators results in a model that is algebraically identified, in the event the model proved to be empirically underidentified due to the small intercorrelations among these variables (see Kenny, 1979). Consequently, the loadings were often small, and varied greatly across disciplines. Of the four variables initially included, the fraction of graduates in Ph.D.-granting institutions was consistently the more reliable indicator, and has been used here as the only indicator of graduate student quality.

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Table 1. Maximum Likelihood Measurement Model Parameter Estimates for a Model of Faculty Reputational Ratings (standard errors in parentheses)

From	To	Discipline					
		English	French	Philos.	Geogr.	PoliSci	Sociol.
		Metric Coefficients					
SIZE	FACNUM	1.00*	1.00*	1.00*	1.00*	1.00*	1.00*
SIZE	GRADNUM	2.88 (.36)	3.65 (.80)	1.99 (.51)	2.09 (.47)	5.08 (.79)	2.72 (.36)
SIZE	STUDNUM	3.66 (.52)	5.24 (1.14)	3.39 (.82)	2.89 (.79)	7.24 (1.13)	4.32 (.57)
GRADQUAL	EMPPHD	1.00*	1.00*	1.00*	1.00*	1.00*	1.00*
RESPROD	PUBSPER	----	----	----	1.00*	1.00*	1.00*
RESPROD	MORE1PUB	----	----	----	0.17 (.03)	0.19 (.02)	0.11 (.01)
RESPROD	GRANTS	----	----	----	0.08 (.02)	0.03 (.01)	0.07 (.01)
		Correlations Among Exogenous Variables					
GRADQUAL	SIZE	.21	.24	.21	.35	.21	.28
RESPROD	SIZE	---	---	---	.20	.23	.30
RESPROD	GRADQUAL	---	---	---	.40	.40	.46
		Squared Multiple Correlations					
	FACNUM	.47	.39	.41	.48	.34	.58
	GRADNUM	.86	.64	.39	.56	.90	.64
	STUDNUM	.57	.66	.50	.35	.75	.64
	EMPPHD	1.00	1.00	1.00	1.00	1.00	1.00
	PUBSPER	---	---	---	.78	.79	.83
	MORE1PUB	---	---	---	.62	.80	.59
	GRANTS	---	---	---	.23	.09	.37

*Fixed parameter.

Table 2. Structural Coefficients for Model of Faculty Reputational Ratings. (standard errors in parentheses)

LATENT VARIABLE	DISCIPLINE English	French	Philos.	Geogr.	PoliSci	Sociol.
			Metric Coefficients			
Size	.069*	.271*	.148*	.161*	.093*	.116*
	(.010)	(.062)	(.040)	(.037)	(.019)	(.015)
Grad Quality	4.336*	1.988*	2.935*	.498	1.955*	.589
	(.622)	(.846)	(.497)	(.638)	(.528)	(.437)
Research	---	---	---	.744*	.408*	.437*
	---	---	---	(.134)	(.118)	(.075)
			Standardized Coefficients			
Size	.647	.720	.470	.593	.504	.668
Grad Quality	.414	.223	.506	.073	.289	.083
Research	---	---	---	.598	.300	.424
R-Square	.701	.647	.574	.918	.628	.868

* Coefficient is at least twice its standard error.

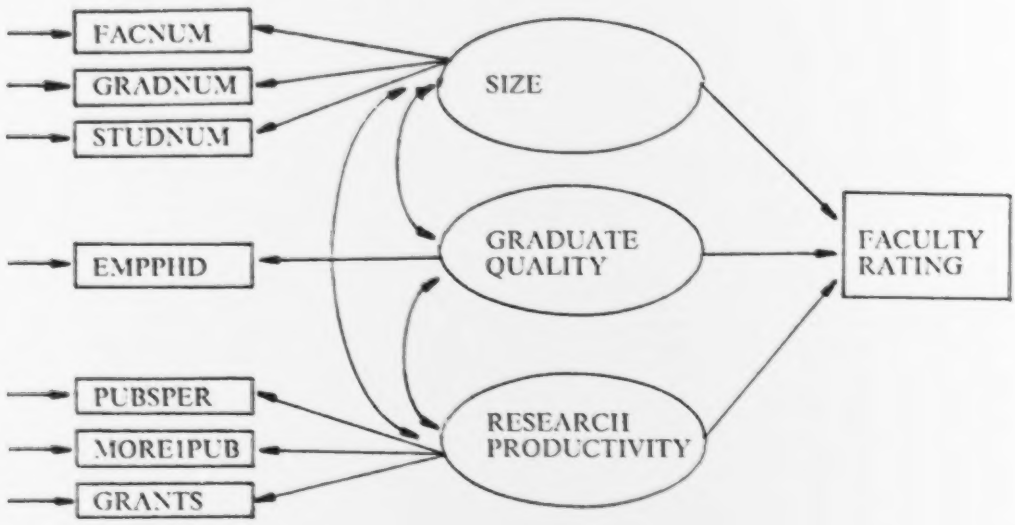

Figure 1. LISREL model of faculty reputational ratings.